

It will be recognized by those skilled in the art that the examples above are provided by way of illustration and that many variations are possible without departing from the spirit and scope of the invention.

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cm I claim:

- Sub A10
1. A process for restoring the injectivity or productivity of a well penetrating a subterranean formation and defining a well bore and a well bore face, the injectivity or productivity of the well being reduced by an accumulation of asphaltene precipitate at the well bore face and/or in the subterranean formation and contacting a low gravity high viscosity asphaltene-based crude, thus lowering its viscosity and causing it to migrate through the subterranean formation by using a gas, such as, air, carbon dioxide, nitrogen, natural gas alone or augmented with injection water and/or a micelle treating fluid, the process comprising:
- injecting the micelle treating fluid into the well penetrating the subterranean formation, the micelle treating fluid being formed by mixing 2 percent potassium chloride water with a mutual solvent comprising alcohol, aromatic hydrocarbon, and an alkyl or alkylaryl polyoxyalkylene phosphate ester surfactant, the 2 percent potassium chloride water and mutual solvent being mixed in a volumetric ratio of about 1 to 1 to about 2 to 1, and contacting the accumulation of asphaltene precipitate with the micelle treating fluid so that it degrades and disperses the accumulation of asphaltene precipitate to substantially restores injectivity or productivity of the well.

Sub 110

2. The process of claim 1 further comprising the injection of a gas, such as, air, carbon dioxide, nitrogen, natural gas either alone or augmented with injection water and/or micelle treating fluid to act as a drive mechanism to move the micelle treating fluid out into the subterranean formation.

5 3. The process of claim 2 wherein a continuous injection of the micelle treating fluid and continuous injection of gas is used as an enhanced oil recovery method for reservoirs producing a low gravity-high viscosity asphaltene-based-crude, when the reservoirs are devoid of any drive mechanism and production is governed by only gravity drainage.

10 4. The process of claim 1 further comprising contacting the low gravity-high viscosity asphaltene-based crude indigenous to the subterranean formation with the micelle treating fluid to thereby reduce the asphaltene-based crude viscosity.

8 4/5 The process of claim 1 further comprising shutting in the well for a period of time sufficient to allow the micelle treating fluid to degrade and disperse the accumulation of asphaltene precipitate, thereby substantially restoring injectivity or productivity of the well.

5 5 The process of claim 4 wherein the well is shut in for a period of 24 to 72 hours.

6 6 The process of claim 1 wherein the alkyl or alkylaryl poloxyalkylene phosphate ester is present in the mutual solvent in the amount from about 5 to 50 weight percent of the

20 7 mutual solvent.

6 8 The process of claim 7 wherein the alkyl or alkylaryl poloxyalkylene phosphate ester surfactant is present in the mutual solvent in an amount from 10 to 20 weight percent of the mutual solvent.

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The process of claim 3 wherein the alkyl or alkyl poloxyalkylene phosphate ester surfactant is present in the mutual solvent in an amount from about 12 to 18 weight percent of the mutual solvent.

Sub A11

10. The process of claim 1 wherein the mutual solvent comprises an alkyl or alkylaryl poloxyalkylene phosphate ester surfactant dissolved in a mixed non-aqueous solvent comprising methanol in an amount from about 20 to 27 percent, isopropanol in an amount of from about 40 to 44 percent, capryl alcohol in an amount of about 8 to 12 percent, and xylene in an amount of from about 23 to 27 weight percent.

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11. The process of claim 10 wherein 2 percent potassium chloride water and the mutual solvent are mixed in a volumetric ratio of about 2 to 1.

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12. The process of claim 1 wherein the micelle treating fluid is injected to contact only the accumulation of asphaltene precipitate in the near well bore of the formation.

Sub A12

13. The process of claim 1 further comprising injecting a gas, such as, air carbon dioxide, natural gas, nitrogen, or mixtures thereof either alone or augmented with injection water and/or micelle treating fluid a second time after the well has been shut in for 24 hours.

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14. The process of claim 13 wherein the well is shut in for an additional 24 hours.

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Sub A13

15. The process of claim 13 wherein the micelle treating fluid is moved out into the reservoir contacting the low gravity high viscosity asphaltene-based crude indigenous to the subterranean formation and, thus reducing its viscosity.

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16. The process of claim 15 wherein the lower viscosity asphaltene-based crude dispersed in the micelle treating fluid is caused to migrate back in the to a stimulated well.

SUB 13

17. The process of claim 16 wherein the lower viscosity asphaltene-based crude dispersed in the micelle treating fluid is caused to migrate to an offset well in fluid communication with the stimulated well by use of a gas, such as, air, carbon dioxide, nitrogen, or mixtures thereof either injected alone or augmented with injection water and or micelle treating fluid.

18. The process of claim 1 wherein the injectivity or production of the well is restored to a greater rate by the process than it was prior to being reduced by the accumulation of asphaltene precipitate.

19. The process of claim 1 wherein the wells treated with the micelle treating fluid are caused to produce a thin asphaltene-based crude by the treatment.

20. The process of claim 1 wherein an offset well in contact with the stimulated well also begins to produce a thin asphaltene-based crude because of the treatment.

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